

Comparison of Environmental Contaminants on Georges Bank and Stellwagen Bank: Metals from F/V Skimmer NEC-EM2001-1 in the Stellwagen Bank, Georges Bank, Wilkinson Basin from 2002-2004 (NEC-CoopRes project)

Website: <https://www.bco-dmo.org/dataset/2787>

Version: final

Version Date: 2006-01-01

Project

» [Northeast Consortium: Cooperative Research](#) (NEC-CoopRes)

Program

» [NorthEast Consortium](#) (NEC)

Contributors	Affiliation	Role
Monosson, Emily		Principal Investigator

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Dataset Description

Comparison of Environmental Contaminants on Georges Bank and Stellwagen Bank - Metals

Project Leader: *Emily Monosson*, Mt. Holyoke College

Additional Participants:

David Lincoln, Commonwealth Corporation

Angela Sanfilippo, Gloucester Fishermen's Wives Association

and over 14 commercial fisherman

"This project investigated the potential for contaminant-induced effects on reproduction and development in both nearshore and offshore cod. Heavy metals, polychlorinated biphenyls (PCBs), and organochlorine pesticides (including DDTs) were measured in cod livers and gonads and sediments from Stellwagen Bank, Georges Bank, and Wilkinson Basin. In general, concentrations of most contaminants were found to be near or below detection limits in cod gonads. Several contaminants were detected in the cod liver including PCBs and DDTs. However, concentrations from Georges Bank were drastically lower than previously published data and below concentrations linked with reproductive or developmental toxicity in fish. Analysis of heavy metals suggests that the concentrations of metals measured in this study are within range of those previously reported in cod except for cadmium. The vast majority of polycyclic aromatic hydrocarbons (PAHs) and metals detected in sediments were below NOAA's Threshold Effects Levels and chlorinated pesticides were below detection limits in the sediments. No one chemical was consistently detected at concentrations suspected of causing adverse effects in cod or their offspring. It would appear that levels of exposure to the chemical contaminants measured are unlikely to have had a considerable impact on the nearshore or offshore cod fishery." *extracted from: Summary of Completed Cooperative Research Projects Funded by the Northeast Consortium, January 2006*

Data Elements

Parameter Names and Descriptions:

Female fish were targeted where a sufficient number of females could be collected, otherwise males were

included in the collection. All data on fish tissues are reported as fresh weight or wet weight.

For more detailed information see: [Final Report](#)

Questions concerning these data should be directed to:

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revised Sept 01, 2006; gfh

Methods & Sampling

The heavy metals As, Cu, Se, Zn, were detected in most fish at all sites, while Hg, Cd, and Ag were detected primarily in cod from the three GB sites. Several metals including Al, Cr, Mn, Tl, and V were detected in only a few fish across all sites or not at all. These metals were dropped from the analysis. Statistical analysis of the four metals detected in all sites reveals a trend in which the concentrations are consistently lower in the SB cod compared to the GB cod. This is interesting, since the sediment trends suggest slightly higher concentrations of metals in SB and WB, compared to GB, although as noted earlier, the sediment data are limited to only two samples and thus can only be considered as a very limited data set. Comparing our results for metals to those of Hellou et al., (1992) who measured trace metals in cod livers collected off the coast of Newfoundland, the mean concentration of Cd in fish from GB was roughly 8-10 fold higher than those concentrations reported by Hellou and Cu is up to 3-fold higher. We were unable to compare our data with concentrations recently reported by the USGS National Water Quality Assessment Program, because they report concentrations in fillet rather than in liver (USGS 2002). Interestingly, the concentrations of Cd in GB cod livers from our study were within the range of concentrations found in fresh water fish (measured as whole-bodies) collected from a lake contaminated by an electroplating plant, and are comparable to some of the higher mean concentrations of cadmium (which ranged from 0.1-19.6) in NOAA's 1987 Status and Trends report (NOAA 1987). The Cd concentrations measured in the GB cod are also within range of cadmium concentrations reported in tilefish livers from several deep sea canyons located in the Middle Atlantic Bight, including one location (Lydonia Canyon) on Georges Bank (Steimle et al., 1996; Steimle et al., 1990). Cadmium and copper are known reproductive and developmental toxicants in fish (reviewed in Sorensen 1991; Jarvinen and Ankley 1999). However, the potential for adverse reproductive or developmental effects in cod caused by Cd at the concentrations measured in this study remain unclear, because the majority of toxicity data relate either exposure concentrations to toxicity, rather than tissue concentrations, or were designed to evaluate life stages and endpoints other than those of interest in this current study. In the gonads, the only metals consistently detected were Fe, Na, Se, K and Zn. Both selenium and Zn were higher in gonads compared to livers, which is in agreement with an earlier study by Hellou et al. (1992), who noted their importance for the normal functioning of certain enzymes.

Data Processing Description

"This project investigated the potential for contaminant-induced effects on reproduction and development in both nearshore and offshore cod. Heavy metals, polychlorinated biphenyls (PCBs), and organochlorine pesticides (including DDTs) were measured in cod livers and gonads and sediments from Stellwagen Bank, Georges Bank, and Wilkinson Basin. In general, concentrations of most contaminants were found to be near or below detection limits in cod gonads. Several contaminants were detected in the cod liver including PCBs and DDTs. However, concentrations from Georges Bank were drastically lower than previously published data and below concentrations linked with reproductive or developmental toxicity in fish. Analysis of heavy metals suggests that the concentrations of metals measured in this study are within range of those previously reported in cod except for cadmium. The vast majority of polycyclic aromatic hydrocarbons (PAHs) and metals detected in sediments were below NOAA's Threshold Effects Levels and chlorinated pesticides were below detection limits in the sediments. No one chemical was consistently detected at concentrations suspected of causing adverse effects in cod or their offspring. It would appear that levels of exposure to the chemical contaminants measured are unlikely to have had a considerable impact on the nearshore or offshore cod fishery."

Data Files

File
contaminants_M.csv (Comma Separated Values (.csv), 49.94 KB) MD5:317f9d0a5ea9a5579b3c5de11bc84013
Primary data file for dataset ID 2787

Parameters

Parameter	Description	Units
site	site number	unitless
location	The location/site where samples were collected, as a geographic name. Location Codes: SB1 is Stellwagon Bank Marine Sanctuary 1, SB2 is Stellwagon Bank Marine Sanctuary 2, GB1 is Georges Bank 1, GB2 is Georges Bank 2, WB is Wilkinson Basin, GBC is Georges Bank/Canadian side	unitless
lat	The latitude where the sample was collected in decimal degrees. North is Positive.	decimal degrees
substrate	composition of sea floor	unitless
sample_id	The sample identification referred to the numbers the fishermen gave for the fish. Each batch of fish had their own sample numbers, depending on which fishermen sampled.	unitless
lipids_pct	percent lipid content of tissue sample	%
solids_pct	percent solids content of tissue sample	%
lon	The longitude where the sample was collected in decimal degrees. West is Negative.	decimal degrees
tissue	L = liver; G = gonads (most often ovaries); 5-10 samples of each tissue was collected.	unitless

len_inch	length of the fish in inches	inches
len_cm	length of the fish in centimeters	centimeters
sex	M or F. Female fish were targeted where a sufficient number of females could be collected. Otherwise males were included in the collection.	unitless
contaminant	Name of the contaminant: arsenic, cadmium, calcium, chromium, copper, iron, manganese, mercury, potassium, selenium, silver, sodium, zinc.	unitless
concentration	Concentration of the contaminant.	mg/kg

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Deployments

NEC-EM2001-1

Website	https://www.bco-dmo.org/deployment/57761
Platform	F/V Skimmer
Report	http://northeastconsortium.org/ProjectFileDownload.pm?report_id=267&table=project_report
Start Date	2002-05-28
End Date	2004-06-08

Description	<p>Other fishing vessels were used in this study, including: F/V Francesca & Carlo, F/V Miss Sandy, F/V Razzo, F/V Caterina G, F/V Santo Vito, F/V Angela Rose, F/V Sabrina Marina, F/V Padre Pio, F/V Giovana. For details and a list of captains, see the deployment report.</p> <p>Methods & Sampling</p> <p>The heavy metals As, Cu, Se, Zn, were detected in most fish at all sites, while Hg, Cd, and Ag were detected primarily in cod from the three GB sites. Several metals including Al, Cr, Mn, Tl, and V were detected in only a few fish across all sites or not at all. These metals were dropped from the analysis. Statistical analysis of the four metals detected in all sites reveals a trend in which the concentrations are consistently lower in the SB cod compared to the GB cod. This is interesting, since the sediment trends suggest slightly higher concentrations of metals in SB and WB, compared to GB, although as noted earlier, the sediment data are limited to only two samples and thus can only be considered as a very limited data set. Comparing our results for metals to those of Hellou et al., (1992) who measured trace metals in cod livers collected off the coast of Newfoundland, the mean concentration of Cd in fish from GB was roughly 8-10 fold higher than those concentrations reported by Hellou and Cu is up to 3-fold higher. We were unable to compare our data with concentrations recently reported by the USGS National Water Quality Assessment Program, because they report concentrations in fillet rather than in liver (USGS 2002). Interestingly, the concentrations of Cd in GB cod livers from our study were within the range of concentrations found in fresh water fish (measured as whole-bodies) collected from a lake contaminated by an electroplating plant, and are comparable to some of the higher mean concentrations of cadmium (which ranged from 0.1-19.6) in NOAA's 1987 Status and Trends report (NOAA 1987). The Cd concentrations measured in the GB cod are also within range of cadmium concentrations reported in tilefish livers from several deep sea canyons located in the Middle Atlantic Bight, including one location (Lydonia Canyon) on Georges Bank (Steimle et al., 1996; Steimle et al., 1990). Cadmium and copper are known reproductive and developmental toxicants in fish (reviewed in Sorensen 1991; Jarvinen and Ankley 1999). However, the potential for adverse reproductive or developmental effects in cod caused by Cd at the concentrations measured in this study remain unclear, because the majority of toxicity data relate either exposure concentrations to toxicity, rather than tissue concentrations, or were designed to evaluate life stages and endpoints other than those of interest in this current study. In the gonads, the only metals consistently detected were Fe, Na, Se, K and Zn. Both selenium and Zn were higher in gonads compared to livers, which is in agreement with an earlier study by Hellou et al. (1992), who noted their importance for the normal functioning of certain enzymes.</p> <p>Processing Description</p> <p>"This project investigated the potential for contaminant-induced effects on reproduction and development in both nearshore and offshore cod. Heavy metals, polychlorinated biphenyls (PCBs), and organochlorine pesticides (including DDTs) were measured in cod livers and gonads and sediments from Stellwagen Bank, Georges Bank, and Wilkinson Basin. In general, concentrations of most contaminants were found to be near or below detection limits in cod gonads. Several contaminants were detected in the cod liver including PCBs and DDTs. However, concentrations from Georges Bank were drastically lower than previously published data and below concentrations linked with reproductive or developmental toxicity in fish. Analysis of heavy metals suggests that the concentrations of metals measured in this study are within range of those previously reported in cod except for cadmium. The vast majority of polycyclic aromatic hydrocarbons (PAHs) and metals detected in sediments were below NOAA's Threshold Effects Levels and chlorinated pesticides were below detection limits in the sediments. No one chemical was consistently detected at concentrations suspected of causing adverse effects in cod or their offspring. It would appear that levels of exposure to the chemical contaminants measured are unlikely to have had a considerable impact on the nearshore or offshore cod fishery."</p>
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Project Information

Northeast Consortium: Cooperative Research (NEC-CoopRes)

Website: <http://northeastconsortium.org/>

Coverage: Georges Bank, Gulf of Maine

The Northeast Consortium encourages and funds cooperative research and monitoring projects in the Gulf of Maine and Georges Bank that have effective, equal partnerships among fishermen, scientists, educators, and marine resource managers.

The Northeast Consortium seeks to fund projects that will be conducted in a responsible manner. Cooperative research projects are designed to minimize any negative impacts to ecosystems or marine organisms, and be consistent with accepted ethical research practices, including the use of animals and human subjects in research, scrutiny of research protocols by an institutional board of review, etc.

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Program Information

NorthEast Consortium (NEC)

Website: <http://northeastconsortium.org/>

Coverage: Georges Bank, Gulf of Maine

The Northeast Consortium encourages and funds

cooperative research and monitoring projects in the Gulf of Maine and Georges Bank that have effective, **equal partnerships** among fishermen, scientists, educators, and marine resource managers.

At the 2008 Maine Fishermen's Forum, the Northeast Consortium organized a session on data collection and availability. Participants included several key organizations in the Gulf of Maine area, sharing what data are out there and how you can find them.

The Northeast Consortium has joined the Gulf of Maine Ocean Data Partnership. The purpose of the GoMODP is to promote and coordinate the sharing, linking, electronic dissemination, and use of data on the Gulf of Maine region.

The Northeast Consortium was created in 1999 to encourage and fund effective, equal partnerships among commercial fishermen, scientists, and other stakeholders to engage in cooperative research and monitoring projects in the Gulf of Maine and Georges Bank. The Northeast Consortium consists of four research institutions (University of New Hampshire, University of Maine, Massachusetts Institute of Technology, and Woods Hole Oceanographic Institution), which are working together to foster this initiative.

The Northeast Consortium administers nearly \$5M annually from the National Oceanic and Atmospheric Administration for cooperative research on a broad range of topics including gear selectivity, fish habitat, stock assessments, and socioeconomics. The funding is appropriated to the National Marine Fisheries Service and administered by the University of New Hampshire on behalf of the Northeast Consortium. Funds are distributed through an annual open competition, which is announced via a Request for Proposals (RFP). All projects must involve partnership between commercial fishermen and scientists.

The Northeast Consortium seeks to fund projects that will be conducted in a responsible manner. Cooperative research projects should be designed to minimize any negative impacts to ecosystems or marine organisms, and be consistent with accepted ethical research practices, including the use of animals and human subjects in research, scrutiny of research protocols by an institutional board of review, etc.

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